

Exponential Functions

Objective: You will be able to identify an exponential function and the transformations that it has undergone.

Exponential Function

- What is a linear function? Example?
- What is a quadratic function? Example?
- What is an exponential function?

Exponential Function

- An exponential function is a function f such that $f(x) = b^x$ such that the base $b > 0$ and $b \neq 1$. x is any real number.
- Examples:
 - $f(x) = 2^x$
 - $g(x) = 3^x$
 - $y = (1/2)^x$
 - $y = (0.1)^x$

$$y = a \cdot f(x-d) + c$$

a	Vertical stretch/compress
f(x)	function “y”
c	Vertical translation
d	Horizontal translation
x	Variable

Reflect over y-axis: $y = f(-x)$

Reflect over x-axis $y = -1 \cdot f(x)$

$$y = a \cdot b^{(x-d)} + c$$

a	Vertical stretch/compress
b	Base
c	Vertical translation
d	Horizontal translation
x	Exponent

Reflect over y-axis: $y = b^{(-x)}$

Reflect over x-axis $y = -1 \cdot b^x$

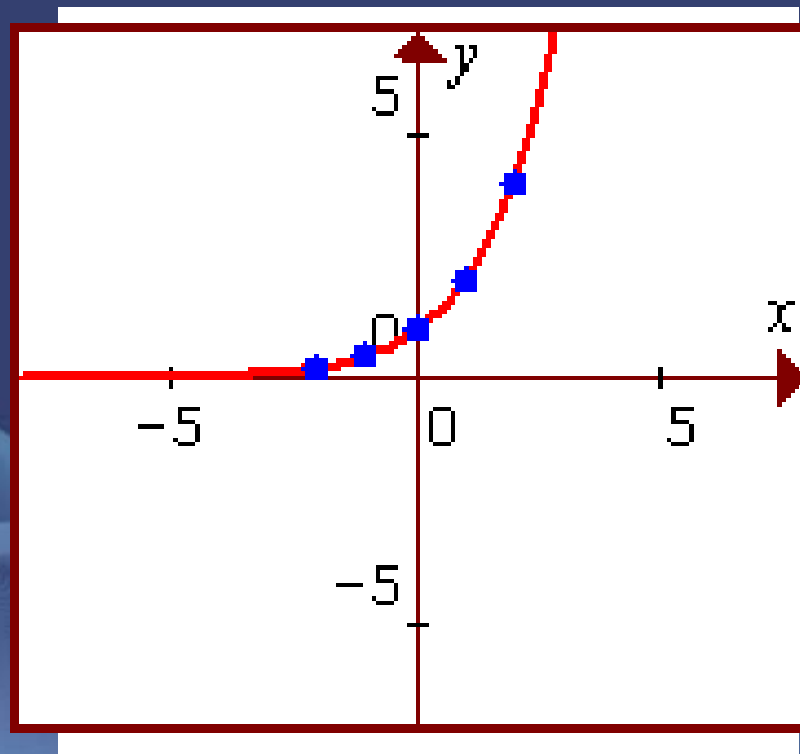
Transformations Involving Exponential Functions

Transformation	Equation $g(x) = b^x$	Description
Horizontal Translation L		
Horizontal Translation R		
Vertical Translation L		
Vertical Translation R		
Reflect y-axis		
Reflect x-axis		
Vertical Stretch		
Vertical Shrink/ Compress		

Example #1

$$y = 2^x$$

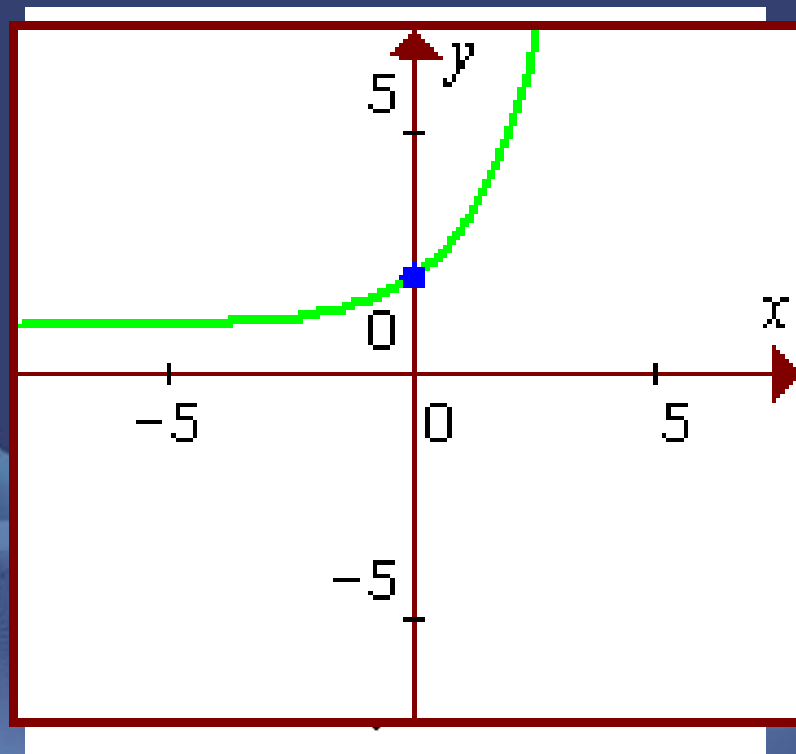
x	y
0	
1	
2	
3	
-1	
-2	



Example #2

$$y = 1 + 2^x$$

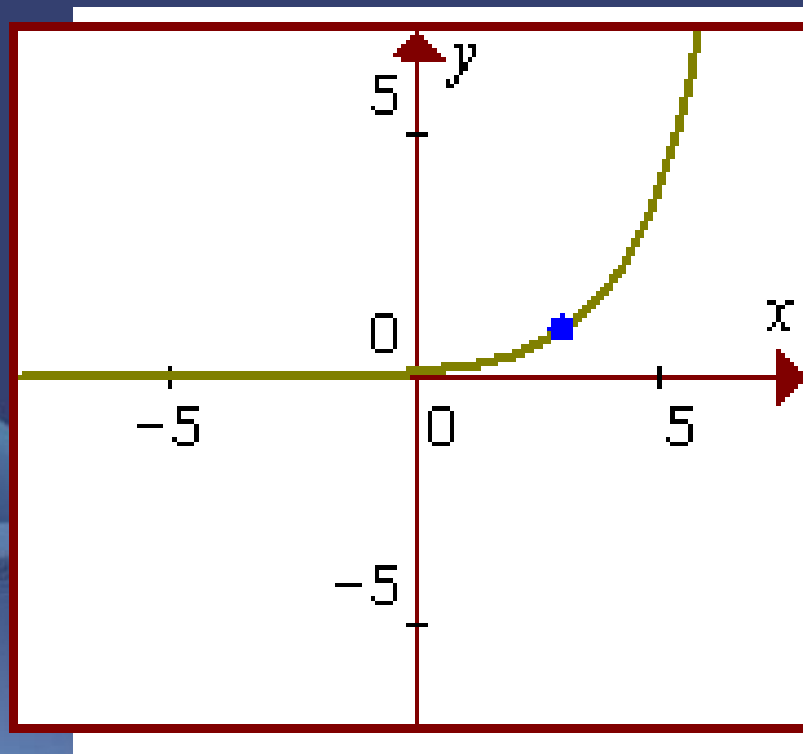
x	y
0	
1	
2	
3	
-1	
-2	



Example #3

$$y = 2^{(x-3)}$$

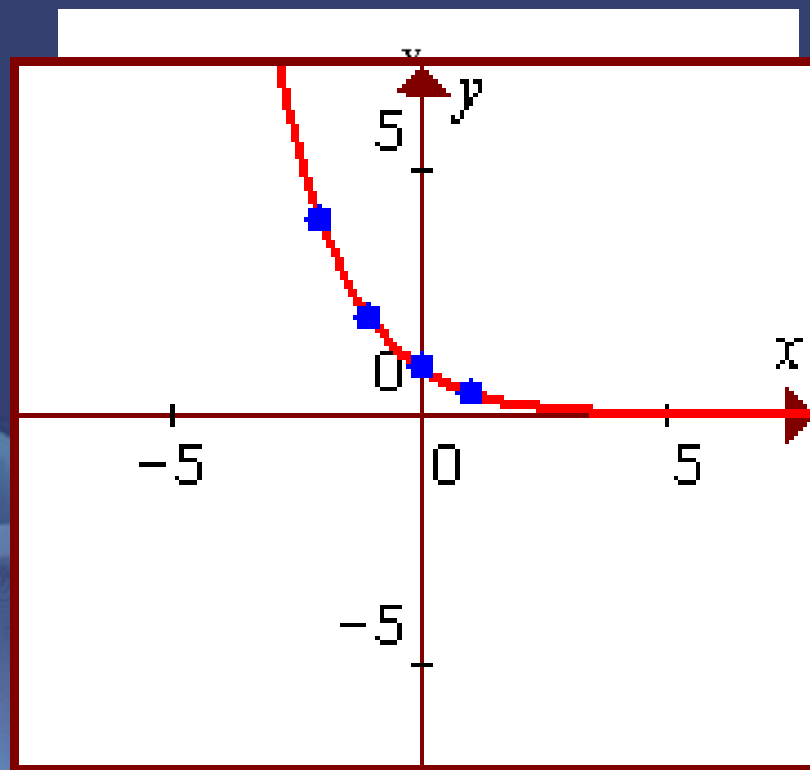
x	y
0	
1	
2	
3	
-1	
-2	



Example #4

$$y = 2^{-x}$$

x	y
0	
1	
2	
3	
-1	
-2	



Let's Transform!

Original function: $y = \left(\frac{1}{5}\right)^x$

Move to the left 3 units

Move up 10 units

Reflect over the x-axis

Final function

Let's Transform...again

Original function: $y = (8)^x$

Move to the right 5 units

Reflect over the y-axis

Stretch vertically 2 units

Final function

$$y = a \cdot b^{(x-d)} + c$$

a	
b	
c	
d	
x	

Transformations Involving Exponential Functions

Transformation	Equation $g(x) = b^x$	Description
Horizontal Translation L		
Horizontal Translation R		
Vertical Translation L		
Vertical Translation R		
Reflect y-axis		
Reflect x-axis		
Vertical Stretch		
Vertical Shrink/ Compress		